

SOME CONSIDERATIONS OF THE GENERA ECHINOCYSTIS  
AND ECHINOPEPON IN THE UNITED STATES  
AND NORTHERN MEXICO

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The genera *Sicyos* and *Sicyoides* as originally proposed in 1737 by Linnaeus encompassed, in addition to the Old World species, what were later to be recognized as the New World genera *Echinocystis*, *Echinopepon*, and *Marah*. The present writer is treating these three New World genera herein and in a subsequent paper. In addition to these three genera the following key includes *Brandegea* and *Vaseyanthus*, two genera whose ranges coincide in part with those of *Echinopepon* and *Marah*, plants of which, in sterile condition, have often been confused with them.

KEY TO THE FIVE GENERA

1. Ovary 1-celled, ovule 1; fruit usually smooth or nearly so, less than 1 cm. long; perennial . . . . . *Brandegea*
1. Ovary more than 1-celled, ovules more than one; fruits usually conspicuously spiny, more than 1 cm. long; annuals except *Marah*.
  2. Plants perennial, stems from large perennial tuber, seeds at least 7 mm. thick. . . . . *Marah*
  2. Plants annual, seeds less than 6 mm. thick.
    3. Sepals and petals 6; seeds large, 14–18 mm. long; northern Arizona, northern New Mexico and northeastern United States . . . . . *Echinocystis*
    3. Sepals and petals 5; seeds less than 10 mm. long; Mexico, southern Arizona, and New Mexico.
      4. Fruit globose; ovules normally 2; Lower California . . . . . *Vaseyanthus*
      4. Fruit ovoid-cylindrical, ovules 4 or more, Argentina to Mexico, southern Arizona, and southern New Mexico . . . . . *Echinopepon*

ECHINOCYSTIS

In *Hortus Cliffortianus*, Linnaeus (1737, p. 452) gives "*Sicyos foliis angulatis*" and under it as a synonym includes Tournefort's "*Sicyoides americana, fructu echinato, foliis angulatis*." The distribution is given as Canada, but one cannot be sure that either of these entities refers to what is now known as *Echinocystis lobata*.

Not until Michaux (1803) described *Sicyos lobata* was this species positively recognizable, but the genus *Sicyos* was later restricted to those cucurbitaceous plants having five-lobed corollas and one-seeded indehiscent fruits growing in firm clusters, so Muhlenberg (1805) published the combination *Momordica echinata* (Michx.) Muhl. In so doing he abandoned the specific name *lobata*. The next generic name applied to this plant was Rafinesque's *Micrampelis* (1808), but because of its inadequate description it has been rejected by most students of this group as a *nomen confusum*. Torrey (1840) erected the genus *Hexameria* for this entity, but later that year, upon finding this name preoccupied, Torrey and Gray (1840) proposed the name *Echinocystis*. Bentham and Hooker (1876) included in the genus *Echinocystis* all the then known

species of the genera which we here recognize as *Echinocystis*, *Echinopepon*, and *Marah*. They considered the perennial California group to be a subgenus. Cogniaux (1878) divided *Echinocystis* into Section I, *Euechinocystis*, which includes the species *lobata* and *oregona*; and Section II, *Echinopepon*, which includes several species here treated as part of the genus *Echinopepon*. Three years later he divided *Echinocystis* into the three sections *Echinopepon*, *Euechinocystis*, and *Marah*. These sections are given generic standing by the present writer. [Specimens cited in this study were assembled in the herbarium of the University of Southern California, Los Angeles. Abbreviations used in citations are those proposed by Lanjouw (1954). In addition, KMS refers to the private herbarium of the author.]

ECHINOCYSTIS Torr. and Gray, Fl. N. Am. 1: 542. 1840. *Sicyos lobata* Michx. Fl. Bor. Am. 2: 217. 1803. Type: "in western Pennsylvania, by [the] Ohio River." *Micrampelis* Raf., Med. Rep. 5: 350. 1808, *nomen rejiciendum*. Description eleven words long and inadequate. *Hexameria* Torr., Rep. Pl. N. Y., 4: 137. 1840; not *Hexameria*, R. Br. in Bennett, Plant. Jav. Rariores, 1838. *Echinocystis* (section *Euechinocystis*) Cogn., Mem. Acad. Sci. Belg. 28: 87. 1878.

Plants annual. Seeds 2–3 mm. thick, 14–18 mm. long. Petals 6. A monotypic genus. Type: *Sicyos lobata* Michx.

ECHINOCYSTIS LOBATA (Michx.) Torr. and Gray, Fl. N. Am. 1:542. 1840. *Sicyos lobata* Michx. Fl. Bor. Am. 2:217. 1803. *Momordica echinata* Muhl., Willdenow Spec. 4:605. 1805. This description is dated two years after Michaux's so the name *M. echinata* is invalid. *Micrampelis echinata* (Muhl.) Raf. Med. Rep. 5:350. 1808. *M. lobata* Greene, Pittonia 2:128. 1890. *Echinocystis echinata* (Muhl.) Britt. Sterns and Pogg. Cat. 1882.

Roots annual with branching secondary roots; stems glabrous or nearly glabrous, climbing or trailing, much-branched, length to 6 m., diam. 1.5–3 mm., the internodes 5–15 (20) cm. long; leaf blades cordate, 5–10 (15) cm. in diam., deeply 5-lobed, the basal sulcus angular to broad and open, 3–15 mm. deep, the apices slender, acute, mucronate, seldom acute, the 3 to 5 lobes broadly triangular to lanceolate, the margins entire, denticulate to somewhat serrate, upper surfaces slightly scabrous to minutely pubescent, the lower almost glabrous; tendrils 3-fid, glabrous, on peduncles 3–5 cm. long; staminate flowers in many-flowered panicles (5) 15–20 (25) cm. long, the racemes of panicles 0.5–3 (15) cm. long, with to 15 flowers each; peduncle and its branches slightly pubescent; pedicels 2–8 (12) mm. long; calyx lobes 6, 2 mm. long, alternate with corolla lobes; corolla inserted on calyx, tube whitish, broadly campanulate 1–1.5 mm. long, 2–3 mm. broad, the lobes deeply parted, greenish-white or white, erect, spreading and linear-lanceolate, five-nerved, sub-obtuse, 4–5 mm. long, 0.75–1 mm. wide at base; stamens with anther heads cylindrical, to 1 mm. long, 0.6–0.8 mm. in diam., 3 locules readily visible, the filament column 0.4 mm. long, 0.17 mm. in diam.; pistillate flowers 1 to several

in axil of staminate inflorescence, usually only 1 mature fruit per node; perianth structure much like that of staminate flowers, tube 1–1.5 mm. long; calyx lobes filiform, 4–5 mm. long; corolla lobes linear-lanceolate, sub-acute, 13–14 mm. long, 1 mm. wide at base; stigma sub-globose, 0.8 mm. in diam., nearly sessile; carpels 2, ovules 2 per carpel; fruit cylindrical-globose, glabrous, 4–5 cm. long, 2.5–3.5 cm. in diam., dehiscent irregularly at apex upon maturity, sparsely covered with slender, glabrous spines, these 3–8 mm. long; peduncle 6–10 (25) mm. long, glabrous; seeds flattened, squash-like, apices obtuse or acute; bases slightly narrowed, truncate, greyish-brown, sometimes slightly mottled and ridged, 14–18 mm. long, 7–8 mm. wide, 2–3 mm. thick.

Type. “. . . in western Pennsylvania, by [the] Ohio River.” The following near-topotype represents our concept of the species and may be taken as a lectotype until such time as some other specimen, historically with better claim to this status, may be located. *T. F. Lucy 3452* (US 966366! photographs KMS! fig. 1).

The genus *Echinocystis* occurs in temperate North America principally east of the Rocky Mountains, and mostly north of the Ohio River in the United States and in southern Canada; apparently escaped from cultivation in various western states (fig. 5).

Representative specimens seen. ARIZONA. Coconino County: Flagstaff, Aug. 20, 1916, *Thorner 8579* ARIZ. COLORADO. Arapahoe County: Clear Creek, Denver, Aug. 7, 1916, *Bettel* CAS; along Platte River, Denver, elev. 5,000 feet, Aug. 17, 1878, *Jones 640* POM. Larimer County: Fort Collins, elev. 5,000 feet, Aug. 28, 1894, *Baker* POM. IDAHO. Ada County: stream bank, Boise, elev. 2,880 feet, Sept. 9, 1911, *Clark 324* DS, GH, POM, US. ILLINOIS. Champaign County: on fences of Crystal Lake Park, Urbana, Sept. 23, 1907, or 1917, *Gates 1995* US. Cook County: South Chicago, 76th St., Aug. 20, 1913, *Smith 5778* GH. De Kalb County: rich soil along river, July–Sept., *Abbott* CAS. INDIANA. Marshall County: near Lake Maxinkuckee, Aug. 24, 1900, *Scovell & Clark* DS. IOWA. Dickinson County: Lakeville Township, Section 2, Aug. 11, 1934, *Hayden 2033* GH. Emmet County: woods along stream, 1883, *Cratty* DS. KANSAS. Riley County: 1896, *Norton 179a* GH. MAINE. Androscoggin County: shore, Auburn, Sept. 19, 1893, *Allen* GH. MASSACHUSETTS. Middlesex County: along Merrimac River, Lowell, Aug. 8, 1927, *Beattie* POM; low bank of Alewife Brook, Cambridge, Aug. 17, 1934, *Smith & Drew 687* ARIZ, CAS, DS, LA, POM. Suffolk County: Boston, *Brandegee* DS. MICHIGAN. Ingham County: Lansing, Aug. 27, 1891, *Toumey* ARIZ. Kent County: Grand Rapids, Aug. 11, 1890, *G.D.S.* CAS. MINNESOTA. Goodhue County: Zumbrota, Aug., 1892, *Ballard* DS, GH. Hennipin County: thickets, north hillside of cemetery, Minneapolis, Sept., 1893, *Perkins* USC. Winona County: river bottoms, July, 1889, *White* POM. MONTANA. Lake County: Ravalli, elev. 3,000 feet, Aug. 2, 1909, *Jones* POM. NEBRASKA. Franklin County: Franklin, Aug. 18, 1929, *Hapeman* POM. Lancaster County: wet ground, Lincoln, north salt lake, elev. 1,160 feet, Aug. 14, 1948, *Kiener 14970* GH. Nemaha County: woody bank, Peru, Sept. 28, 1934, *Winter 99* US. NEW HAMPSHIRE. Coos County: Gorham, Aug. 19, 1908, *Moore 4283* POM. NEW JERSEY. Bergen County: Jersey City, Sept., 1900, *Dautun* LA. NEW MEXICO. San Miguel County: Las Vegas, Gallinas River, Aug., 1927 UC; vicinity of Las Vegas, Sept., 1919, *Anect 1* US. NEW YORK. Albany County: banks of reservoir, Switzerland, Aug. 10, 1939, *House 26894* CAS. Chemung County: banks of Chemung River, Sept. 8, 1896, *Lucy 3452* US. Greene County: wet ground, Big Hollow, elev. 1,700 feet, Aug. 20, 1897, *Barnhart 2389* US. Tompkins County: rich moist low ground, Ithaca, Aug. 9, 1916, *Munz 343* POM. NORTH DAKOTA. Benson County:

Leeds, Sept. 2, 1906, *Lunell* DS. Burleigh County: Bismark, Aug. 14, 1927, *Larsen* 169 GH. McHenry County: river banks, Souris River, Towner, July 31 and Sept. 10, 1913, *Leeds* US. OHIO. Highland County: waste bottom land, Hillsboro, Sept. 27, 1935, *Demaree* 11580 US. Lorain County: Elyria Aug., 1894, *Dick* DS. Pickaway County: river bottoms, Scioto and Circleville, Sept. 2, 1935, *Demaree* 11659 DS, US. OREGON. Marion County: thicket along Mill Creek, Salem, "introduced?", Sept. 13, 1919, *Nelson*, 2934 GH. PENNSYLVANIA. Philadelphia County: western Philadelphia, Oct. 1, 1926, *Adams* 616 GH. RHODE ISLAND. Providence County: Providence, Aug. 22, 1878, *Stanford* POM. SOUTH DAKOTA. Lincoln County: Sioux River Basin, Aug. 11, 1892, *Thorner* ARIZ. Roberts County: Big Stone Lake, Aug., 1894, *Griffiths & Slosser* 257 CAS. Union County: rich alluvium along edge of timber, Aug. 18, 1898 DS. VERMONT. Caledonia County: St. Johnsbury, Aug. 14, 1874, *Stanford* DS. Rutland County: alluvial banks and waste places, frequent, Middletown Spring, Aug. 5, 1934, *Carpenter* CAS. WASHINGTON. Whatcom County: escaped, Sumas, Aug. 21, 1937, *Muenschner* 8386 GH. WEST VIRGINIA. Greenbrier County: low ground along stream 2 miles west of White Sulphur, Aug. 12, 1922, *L. & F. Randolph* 1228 GH. WISCONSIN. Brown County: De Pere, Aug. 1, 1888, *Kellogg* US. Buffalo County: wooded summit, Eagle Bluff, Fountain City, Aug. 25, 1927, *Fassett & Wilson* 5502 USC. Rock County: Beloit, *Swezey* CAS. Sheboygan County: Sheboygan, 1874, *Swezey*. Winnebago County: Oshkosh, July 30, 1909, *Clemens* POM. WYOMING. Yellowstone Park: Meldrum Gulch near Mammoth Hot Springs, Sept. 13, 1902, *Mearns* 3967 US. CANADA: SASKATCHEWAN, 1857-8, *Bourgeau* GH. QUEBEC. Longueuil, Ile Plate, near Montreal, Oct. 28, 1928, *Marie-Victorin* 28267 GH. NOVA SCOTIA. Colchester County: Aug. 26, 1927, *Prince & Atwood* 732 DS. ONTARIO. Bruce County: Tobermory Village. Bruce Peninsula, Sept. 2, 1933, *Krotkoy* 7824 GH.

Germination of seeds of *Echinocystis lobata*, although long known to be difficult, has been accomplished by the writer. The cotyledons, which were raised far above the soil surface where they became long and green, continued to function as leaves for forty days. They turned yellow at about the same time that the lowest pair of true leaves started to lose their function. It has been effectively demonstrated that "after-ripening" is necessary for the germination of the seeds of *Echinocystis lobata*.

#### ECHINOPEPON

Naudin (1866) described the genus *Echinopepon* on the basis of his observations of plants grown in the Museum of Natural History in Paris. Cogniaux (1878) first recognized *Echinopepon* as one of two, and later as one of three, sections of *Echinocystis*. Rose (1897) and writers of floras have for the last fifty years rather consistently considered *Echinopepon* as a genus separate from but allied to *Marah* and *Echinocystis*. Reference to the distributional maps reveals that the species dealt with in this treatment are centered on the plateau and toward the western coast of Mexico, while those not included herein, appear, from preliminary studies to be concentrated near and south of Mexico City.

ECHINOPEPON Naud. Ann. Sci. Nat. Bot. ser. 5,6:17. 1866. Type: *Marah horridus* Naud., designated here. *Echinocystis* (section *Echinopepon*) Cogn., Mem. Acad. Sci. Belg. 28:87. 1878; D.C. Monogr. Phan. 3:800, based on *Echinopepon* Naud. *Elaterium* O. Ktze., *pro parte typica*, Rev. Gen. 1: 257. 1891, in synonymy.

Roots annual, taproot with branching secondary roots. Stems glabrous to vestite, climbing or trailing, mostly slender, vertically striated. Leaf blades thin, cordate, almost entire, to more or less deeply 3 to 7- mostly 5-lobed, basal sulci open to almost closed; petioles one-half as long as to as long as leaves. Tendrils bifid or trifid, on peduncles about equal to petiole length. Staminate flowers in racemes, occasionally in panicles; caducous, pedicels persistent; corolla inserted on calyx; calyx lobes small, alternate with larger corolla lobes; corollas campanulate or rotate (4) 5 (6)-merous; anthers 5, almost fused, or fused into globose or discoid head; filaments fused. Pistillate flowers solitary, occasionally in 2's or 3's, from same nodes as staminate inflorescences, larger than staminate flowers. Ovary 2-celled, 2-5 ovules per cell; ovules erect, seldom horizontal. Fruits ovoid or ellipsoidal; beak slender, tapering to point, usually circumscissile, operculate, and conspicuously spiny. Seeds 2-5 per carpel, usually quadrangular, flattened, more or less rugose, dark. This description applies only to the species included in this paper.

#### KEY TO THE FIVE SPECIES OF ECHINOPEPON

1. Fruit more than 15 mm. in diameter; petiole hairs 1 mm. or more long.
  1. *E. horridus*
1. Fruit less than 15 mm. in diameter; petiole hairs less than 1 mm. long.
  2. Petal apices quite obtuse, often emarginate; seeds with a conspicuous elliptical depression both in dorsal and in ventral surfaces. . . . . 2. *E. coulteri*
  2. Petal apices acute or slightly obtuse; seeds without a conspicuous elliptical depression in dorsal and ventral surfaces.
    3. Fruiting peduncles filiform, more than 4 cm. long when mature, more or less coiling; seeds 4.5-5 mm. long. . . . . 5. *E. cirrhopedunculatus*
    3. Fruiting peduncles not filiform, less than 3.5 cm. long when mature, not coiling.
      4. Fruits 2-3 cm. long; seeds 5-7 mm. long. . . . . 3. *E. wrightii*
      4. Fruit less than 2 cm. long; seeds less than 4.5 mm. long, with thin, frequently twisted beak. . . . . 4. *E. minimus*

1. ECHINOPEPON HORRIDUS Naud., Ann. Sci. Nat. Bot. ser. 5,6:19. 1866. Type: Naudin, Paris Botanical Garden from seeds obtained by Bourgeau [in Mexico]. (Isotype GH! photographs, KMS! fig. 1.)

*Echinocystis* (section *Echinopepon*) *lanatus* Cogn., Mem. Acad. Sci. Belg. 8,28:92. 1878. Type: *Galeotti*, without number, Herbarium of Horticulture, Bruxell, not seen; photograph (US!). *Micrampelis lanata* O. Ktze., Rev. Gen. 1:257. 1891, in synonymy. *Echinopepon lanatus* (Cogn.) Rose, Contr. Nat. Herb. 5:117. 1897, in synonymy.

*Echinopepon jaliscanus* Rose, Contr. U.S. Nat. Herb. 5:117. 1897. Type: Tequila, State of Jalisco, Mexico, *Pringle 4563* (US! photograph KMS!; UC! DS! GH!)

Stems up to 4 mm., sparsely villous, the internodes (7) 10-20 (30) cm. long; leaf blades cordate, (6) 8-10 (12) cm. wide, not quite as long, 3-5 (7) lobed, lobes usually short, the apices acute or obtuse, that of the central lobe often more acute than the others, the basal sulcus to 4.5 cm. broad, about half as deep, the margins almost entire to somewhat den-



ticulate the upper surfaces thickly to sparsely pubescent, lower less so; petioles 5–12 (20) cm. long, densely lanate; tendrils trifid (bifid), heavy, sparsely pubescent; peduncles 3–8 cm. long, pubescent; staminate flowers 15–25 per raceme, racemes 15–30 (40) cm. long, sparsely villous; pedicels 8–12 (15) mm. long; calyx lobes quite variable, broadly lanceolate, acuminate to deltoid, 0.67 to 2 (3) mm. long, 0.33 to 1.33 mm. wide at base, often with 3 greenish vertical lines, outer surface sparsely pubescent; corolla campanulate, basal portion flattened, the tube to 5 mm. long, often greenish and with 10 green vertical lines, the lobes deltoid, or sides slightly longer than the base, inner surfaces glandular-stipitate; stamens with anther head globose-cylindrical, 1.33 to 2 mm. in diam., to 2 (3) mm. long, upper third of each anther free in young flowers, the filament column 1–2 (3) mm. long, 0.2–0.4 mm. in diam.; pistillate flowers solitary or geminate, to 14 (15) mm. in diam., much shorter than wide; corolla campanulate, with flat base, multicellular trichomes within, lobes broadly subulate or deltoid, to 6 mm. long and 3.75 mm. across the base; stigma flattened-discoïd, or globose, 2.33–3 mm. in diam., 0.75–1.33 mm. thick; style 2–3 (3.5) mm. long, 0.25–0.5 mm. in diam.; fruit heavy, oblong-obovoid, including beak 3–4.5 cm. long, 2–3 cm. in diam., beak (1.5) 2–3 cm. long, fruit and beak pubescent, the spines heavy, to 17 mm. long, bases to 3 mm. broad; peduncles nearly sessile, to 1.5 (2) cm. long; seeds oblong-elliptical in outline, 7–8 mm. long, 5–6 mm. wide, 2.5 mm. thick, apex tridentate, brownish, shallowly rugose.

In western Mexico from Baja California and Sinaloa, south to Costa Rica (fig. 5).

Representative specimens seen. MEXICO. BAJA CALIFORNIA: Arroyo Hondo, near Comondu, Oct. 22, 1893, *Brandege* UC. JALISCO: Bolaños, Sept. 10–19, 1897, *Rose* 2857 US; Tequila, Sept. 30, 1893, *Pringle* 4563 DS, GH, UC, US. MEXICO: barranca, 880 meters, Anonas, Temascaltepec, Nov. 15, 1933, *Hinton* 5211 GH; Limones, District of Temascaltepec, Oct. 3, 1932, *Hinton* 1968, GH. MICHOACAN: hill west of Jaconia, Oct. 17, 1940, *Moore* 134 GH. NAYARIT: open, partially overflowed country, 50 meters south of Ruiz, Oct. 24, 1926, *Mexia* 982 CAS, GH, UC; roadside shrubbery 1 mile from Tepic on the Puga road, Nov. 5, 1925, *Ferris* 5775 DS. OAXACA: De La Laguna a Ojitalan, 350 meters, Distrito de Tuxtapeç, Oct. 21, 1919, *Conzatti* 3756 GH. SINALOA: Culiacan, Sept. 17, 1904, *Brandege* UC. VERA CRUZ: Escamella near Orizaba, Oct. 7, 1866, *Bourgeau* GH. COSTA RICA: Cartago, elev. 4,250 feet, Nov., 1887, *Cooper* 5775 GH, US; San Jose, Nov. 18, ?, *Pittier & Durand* 1390 US. GUATEMALA: Coban, Dept. Alta Verapaz, Dec., 1886, *von Turckheim* 1099 GH, US.

2. *ECHINOPEPON COULTERI* (Gray) Rose, Contr. U.S. Nat. Herb. 5:116. 1897. *Elaterium coulteri* Gray, Pl. Wright. [Smiths. Contr. Knowl.] 5, part 2:61. 1853. Type: Zacatecas, Mexico, *Coulter* 51 (GH!) photographs KMS! fig. 2. *Echinocystis* (section *Echinopepon*) *coulteri* (Gray) Cogn., Mem. Acad. Sci. Belg. 28:88. 1878. *Micrampelis coulteri* (Gray) O. Ktze., Rev. Gen. 1:257. 1891.

*Echinopepon confusus* Rose, Contr. U.S. Nat. Herb. 5:115. 1897. Type: Pinos Altos Mts. [Grant County, New Mexico], Sept. 16, 1880, *E. L. Greene* (US! photograph KMS!)



FIG. 2. *Echinopepon conulteri*, type, Coulter 51 GH (left) ; *E. wrighthii*, type, Wright 1090 GH (right).



*Echinopepon nelsoni* Rose, Contr. U.S. Nat. Herb. 5:117. 1897. Type: "in the valley about Cuicatlan," State of Oaxaca, *Nelson 1878* (US!; Co-type GH! [*Gonzales 36*, Dec., 1895]; photograph KMS!)

*Echinopepon parvifolius* Rose, Contr. U.S. Nat. Herb. 5:118. 1897. Type: Huitzo, Oaxaca, *Conzatti 139* (GH, photographs; isotype US!)

Stems slender, to 1.5 mm. in diam., sparsely pubescent, the internodes 6–15 cm. long; leaf blades round-cordate, to 5 (7) cm. wide; 3–5 (7) cm. long, deeply or occasionally shallowly 3–5 lobed, the apices obtuse to acuminate, the basal sulci 1.5 cm. deep, 1.5–2 cm. wide, the margins entire to slightly sinuate-denticulate, the upper surfaces, especially along veins, hispid, the lower less so; petioles 2–5 (7) cm. long, pubescent; tendrils trifid on peduncles to 1.5–3 cm. long; staminate flowers to 15 per raceme, racemes to 14 (20) cm. long; pedicels 9–12 mm. long, slightly pubescent, several pedicels arising from one point; calyx lobes filiform-lanceolate, 0.4 to 1 mm. long, often greenish and thick; corolla campanulate, 10–12 mm. in diam., the lobes oblong or deltoid, to 5 mm. long and 2 (3) mm. wide at base, obtuse to emarginate, surfaces glabrous or with outer surfaces slightly pubescent; stamens with anther-head globose-flattened, 1 mm. in diam., definitely grooved, the anther column 0.2–0.33 mm. in diam., to 1.5 mm. long; pistillate calyx lobes filiform to subulate, 0.5 to 1.5 mm. long; corolla campanulate, 8–12 mm. in diam., lobes oblong-deltoid, often spatulate, 5–6 mm. long, 2.5–3 mm. wide at the base, apices obtuse, often emarginate; stigma globose, flattened, more rounded above than below, 1.2 to 1.5 mm. in diam., 0.5–1 mm. high, very slightly pubescent; style slender, 1.2–1.5 mm. long, 0.25–0.33 mm. in diam.; fruit obovoid, exclusive of beak, 20–30 mm. long, 12 mm. in diam., beak 5–8 mm. long, fruit and beak pubescent; spines to 5 mm. long, to 0.2 mm. in diam., pubescent; peduncle 1–2 (2.5) long, pubescent; seeds oblong-ovate, to 4.7 mm. long, 4 mm. wide, 2 mm. thick, brownish-black, rugose with conspicuous vertical elliptic depression on 2 largest surfaces, the apex flattened, or grooved.

In the United States in New Mexico, south on the Mexican plateau from Chihuahua to Oaxaca (fig. 5).

Representative specimens seen. UNITED STATES. NEW MEXICO. Donna Ana County: chiefly in the valley of the Rio Grande, below Donana, prior to 1888, *Emory 317* US. Grant County: Pinos Altos Mountains, August, 1880, *Greene* POM; Pinos Altos Mountains, Sept. 16, 1880, *Greene* GH. Hidalgo County: Copper Mines, Oct., 1851, *Thurber 1122* GH; limestone hills, elev. 6,600 feet, Kingston, Sept. 14, 1904, *Metcalf 1348* CAS, GH, POM, US. Socorro County: Magdalena Mountains, elev. 6,500 feet, Aug. 30, 1909, *Goldman 1665* US. MEXICO. CHIHUAHUA: Santa Clara Mountains, Oct. 10–19, 1935, *Lesueur 419* GH, UC. DURANGO: city of Durango, April–Nov., 1896, *Palmer 856* UC, US; steep rocky volcanic slopes with oak, coarse grass, elev. 2,000 meters, Canyon Cantero, Sierra Gamon, Sept. 21, 1948, *Gentry 8384* AHFH. HIDALGO: Pachuca, elev. 8,050 feet, July 19, 1935, *Fisher 35289* ARIZ, GH. OAXACA: Cuicatlan, elev. 1,600 feet, Dec. 10, 1895, *Gonzalez 36* GH; valley above Cuicatlan, elev. 1,800 feet, Nov. 3, 1894, *Nelson 1878* US; Huitzo, elev. 1,600 meters, Oct. 1, 1895, *Conzatti 139* GH, US; Sierra de San Felipe, elev. 7,500 feet, Oct. 5, 1894, *Pringle 4958* GH, UC. PUEBLA: Cerro del Corral de Piedra, elev. 8,000–9,000 feet,

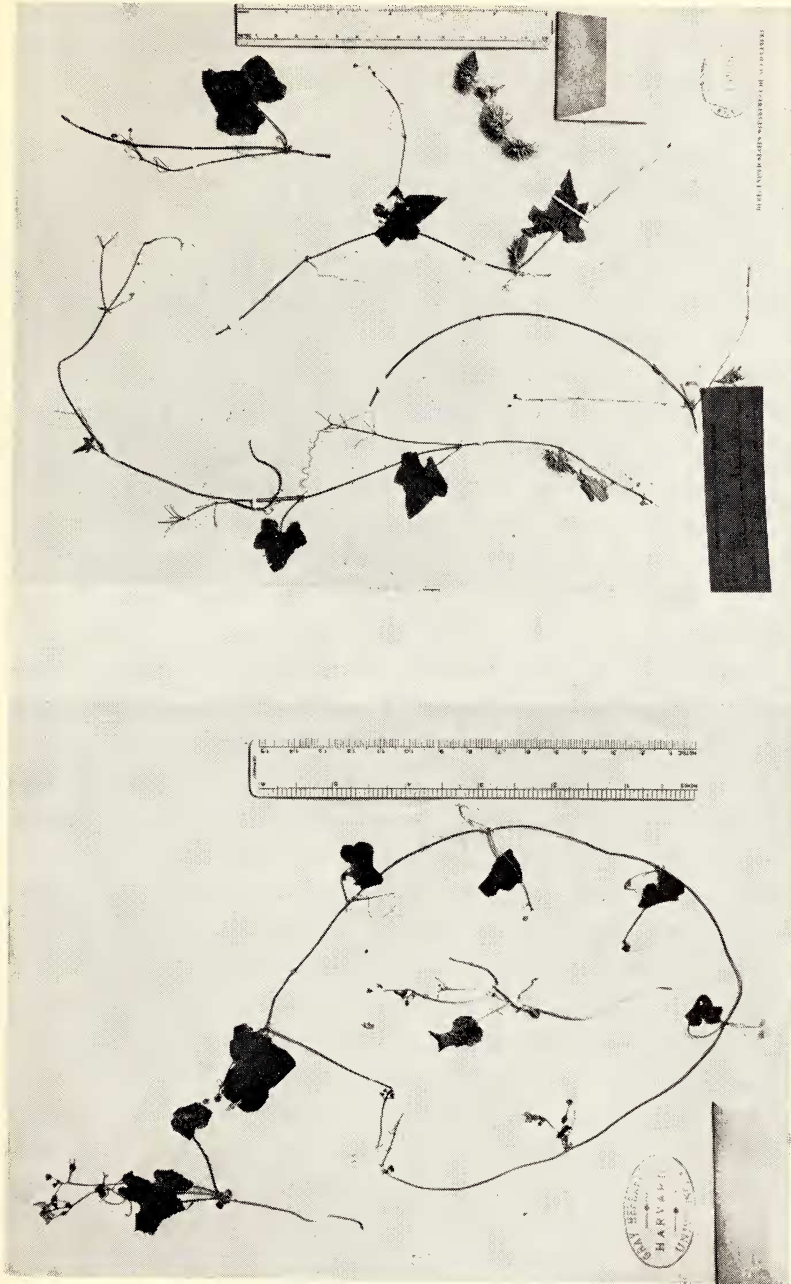


FIG. 3. *Echinopepon minimus* var. *minimus*, duplicate of lectotype, Streets GH (left) ; *E. cirrhopedunculatus*, type, Palmer 634 US (right).

Aug., 1909, *Purpus* 4222 UC; vicinity of San Luis Tultitlanapa, near Oaxaca, July, 1908, *Purpus* 3548 GH, UC. ZACATECAS: between Colotlan and Plateado, Aug. 31, 1897, *Rose* 2699 GH; Zacatecas, *Coulter* 51 GH.

3. ECHINOPEPON WRIGHTII (Gray) Wats., Bull. Torrey Club 13:158, 1887. *Elaterium wrightii* Gray, Pl. Wright [Smiths. Contr. Knowl.] 5 part 2:61. 1853. Type: "Mts. at Guadalupe Pass, Oct. . . . Oregon Mts., near El Paso, May, 1851," *Wright* 1090 (UC!, photographs KMS!, fig. 2; isotypes US! 2 at GH!). *Echinocystis* (section *Echinopepon*) *wrightii* (Gray) Cogn., Mem. Acad. Sci. Belg. 28:88. 1878. *Micrampelis wrightii* (Gray) O. Ktze., Rev. Gen. 1:257. 1891.

Stems 0.5 to 2 mm. in diam., glandular-pubescent, the internodes 5–15 cm. long; leaf blades cordate, 3–9 cm. in diam., the terminal apex acuminate or acute, other apices commonly obtuse, the basal sulci to 2 cm. wide, about 0.75 as deep, the margin almost entire to shallowly 3–5 lobed, at times somewhat undulate or broadly dentate, both surfaces finely hispid; petioles 2–5 cm. long, pubescent; tendrils trifid (or bifid), pubescent, on peduncles 2–4 cm. long; staminate flowers in racemes or occasionally in panicles, 8–20 flowers per raceme, the racemes 6–12 cm. long, flowers usually clustered at distal 1–3 cm.; pedicels 3–12 mm. long, several often arising from one point, flexuous; calyx lobes linear-lanceolate, 0.25–0.5 mm. long, greenish; corolla broadly campanulate, to almost rotate, (6) 7–8 (9) mm. in diam., tube greenish in young flowers, often conspicuously 10-lined, the lobes unequal, nearly deltoid to broadly lanceolate, obtuse, 3–4 mm. long, 1.5–2.5 mm. wide at the base, the margins and inner surfaces conspicuously glandular, the glands frequently reddish; stamens with anther heads sub-globose, 1–1.5 mm. in diam., 0.67 as thick, smooth, with 5 vertical lines, the filament columns 1.5 mm. long, slender; pistillate calyx lobes linear-lanceolate, 0.2–0.67 mm. long, greenish; corolla campanulate, 9–11 mm. broad, the lobes deltoid to broadly lanceolate, 3–4 mm. long, 1.5–2.5 mm. wide at the base; stigmas 0.75 to 1.5 mm. in diam., about one half as thick; style 1 mm. long; fruit ovoid-cylindrical, exclusive of beak 20–30 mm. long, 10–15 mm. in diam.; beak 10–15 mm. long; fruit and beak somewhat villose; spines 3–15 (30) mm. long; peduncles slender, 5–15 mm. long; seeds oblong-obovoid, dorso-ventrally flattened, apex truncate, narrow at the base, 5–7 mm. long, 3.5–4 mm. wide, 1–2 mm. thick, conspicuously rugose, brown.

In the United States in southeastern Arizona and southern New Mexico, thence south in Mexico in Sonora and Sinaloa (fig. 5).

Representative specimens seen. ARIZONA. Pima County: Baboquivari Mountains, Sept. 19, 1931, *Jones* CAS, DS, POM, UC; near reservoir, Mendoza Canyon, Coyote Mountains, elev. 3,200 feet, Oct. 5, 1946, *Gould* 3940 ARIZ, US, CAS, GH; 8 miles south of Vail, elev. 4,000 feet, Aug. 31, 1903, *Jones* DS, POM, US. Santa Cruz County: near Nogales, Aug. 28, 1927, *Peebles & Harrison* 4729 US. NEW MEXICO. Otero County or Eddy County: mountains near El Paso, at Guadalupe Pass, 1852, *Wright* 1090 GH, US. MEXICO. SONORA: grassland, elev. 2,900 feet, 9 miles west of La Angostura, August 19, 1941, *White* 4036 GH; Agua Zarca, south of Colonia Morelos, elev. 3,400 feet, Sept. 19, 1941, *White* 4449 GH; Los Esqueros, elev. 4,900

feet, Oct. 15, 1890, *Hartman 168* GH, US; Río Magdalena, eight miles east of junction of Cananea road and highway, Sept. 9, 1934, *Wiggins 7067* DS; Magdalena, 9 miles northeast of Imuris, Sept. 9, 1934, *Shreve 6621* ARIZ; gravelly flat, elev. 2,350 feet, 2.5 miles north of Matape on road to Batuc, Sept. 11, 1941, *Wiggins & Rollins 465* DS, GH, UC; shrub zones on the canyon floors, west slope of the Sierra Madre, El Río Bonito about Nopalera, Municipio de Nacore Chico, Oct. 4, 1939, *Muller 3617* GH, UC; shrub-grassland, mesa, with cholla, near Navajoa, Oct. 27, 1939, *Gentry 4754* AHFH, DS, GH; wash, 5 miles east of Sacaton crossing on road to Ures, Sept. 18, 1934, *Wiggins 7297* DS, GH; along banks of dry stream, along water course 5 miles south of San Rafael, Oct. 21, 1932, *Wiggins 5925* DS, US; mesquite, grassland, Valle de Teras, Rio de Bavispe region, Aug. 28, 1940, *Phillips 754* GH. SINALOA: Yerba Buena near Culiacan, Oct. 15, 1904, *Brandege* UC. Yerracito, near Culiacan, Sept. 26, 1904, *Brandege* UC.

4. *ECHINOPEPON MINIMUS* (Kell.) Wats., Proc. Am. Acad. Arts & Sci. 24:52. 1889. *Marah minima* Kell., Proc. Calif. Acad. Sci. ser. 1, 2:18, 1863.

Stems to 1 mm. in diam., glabrous or nearly so, often with a bloom, the nodes glabrous to more or less clothed with hyaline hairs, these to 6 (10) mm. long, the internodes 4–12 cm. long; leaf blades cordate, to 6 (10) cm. broad, about as long, shallowly 3–5-lobed to more or less deeply 5-lobed, the apices acuminate, acute, to obtuse, the basal sulci broad open to somewhat closed, the margins almost entire to serrulate or dentate, the upper surfaces scabrous, often with mineralized white papillae, or nearly glabrous, the lower surfaces more nearly glabrous; petioles 1–3 (6) cm. long, glabrous; tendrils filiform-bifid, on peduncles 1–3 (4) cm. long, glabrous; staminate flowers 6–12 (20) per raceme, racemes (2) 3–6 (12) cm. long; pedicels 3–12 (20) cm. long, several often arising from one point, sparingly hispid to glandular pubescent; calyx lobes 0.2 to 0.5 mm. long, filiform or subulate, greenish; corolla campanulate, 5–7 (9) mm. in diam., lobes unequal, to 4 (5) mm. long; 2–3 (5) mm. wide at the base, acute or obtuse, conspicuously glandular on margins and within; stamens with anther mass thickened-discoïd, to 2 mm. in diam., and 1 mm. thick, edged with 5 symmetrical U-shaped locules, the anther column to 1.5 mm. long; pistillate flowers 5–6 (7) mm. broad; calyx lobes 0.33–0.4 mm. long, linear-subulate to filiform; corolla lobes 2.5 (3) mm. long and 1 (2) mm. wide at the base, apices obtuse, conspicuously glandular on the margin and within; stigma globose 1 (1.4) mm. in diam., surface glandular; style 1 mm. long; fruit oblong-obovoid, exclusive of beak 6–12 (15) mm. long, 6–7 mm. in diam., beak 4–7 mm. long; fruit and beak almost glabrous, very slightly pubescent; spines 4 mm. long, 0.6 mm. in diam. at the base, peduncles 1–3 (8) cm. long; upper portion of seed rectangular, basal portion narrower, thinner and retuse, 3–3.5 (5) mm. long, 1–1.5 mm. wide, 1–1.2 mm. thick, smooth, black, with transverse, brown, raised markings.

#### KEY TO VARIETIES

- Peduncles 1–3 cm. long; leaves not deeply dissected . . . . . a. var. *minimus*  
 Peduncles 4–8 cm. long; leaves deeply dissected . . . . . b. var. *peninsularis*



FIG. 4. *Echinopepon minimus* var. *peninsularis*, type, Dawson 1193 AHFH.

4a. *ECHINOPEPON MINIMUS* (Kell.) Wats., Proc. Amer. Acad. Arts & Sci. 24:52. 1889. var. *minimus* nom. nov. Type: Cerros [Cedros] Island, Mr. John A. Veatch. The type specimen may have been destroyed by the San Francisco fire of 1906. The following specimen represents the author's concept of the species and may be taken as a lectotype. *Streets* (US! isotype GH! photographs KMS! fig. 3) *Elaterium minimum* Wats., Proc. Amer. Acad. Arts & Sci. 12:252. 1877. *Echinocystis* (section *Echinopepon*) *minima* Cogn., D.C. Monogr. Phan. 3:805. 1881. *Micrampelis minima* O. Ktze., Rev. Gen. 1:257. 1891.

Nodes lacking conspicuous hyaline hairs; leaf blades not deeply dissected, to 6 cm. in diam.; staminate racemes 3–6 cm. long, flowers to 7 mm. in diam.; fruit with beak to 16 mm. long, peduncle less than 2 cm. long; seeds not over 3 mm. long.

Known only from Cedros Island, Mexico (fig. 5).

Representative specimens seen: MEXICO. BAJA CALIFORNIA. Cedros Island: March-June, 1897, *Anthony 299* DS, GH, UC, US; April 7, 1897, *Brandegee* UC; March 14, 1939, *Elmore A12* AHFH; March 18-20, 1889, *Palmer 719* GH, US; March 12, 1911, *Rose 16163* GH, US; July 18, 1905-1906, *Stewart 31* CAS; 1876, *Streets* GH, US.

The intergradation between var. *minimus* and var. *peninsularis* is so complete that there are more intergrades than members of either variety. Dr. H. S. Gentry, who named *E. peninsularis* a species, looked over the division presented herewith of specimens into var. *minimus*, *peninsularis*, and intermediate groups. He agreed with this division, but considers *minimus* and *peninsularis* as separate species which readily intergrade (fig. 3).

The following collections are examples of these intergrades. MEXICO. BAJA CALIFORNIA: Agua Colorado to Cerro Colorado, elev. 100-500 feet, Dec. 15, 1905, *Nelson & Goldman 7320* US; Arroyo de Tecolote near lava flow, sandy valley, southern Vizcaino Desert . . . with *Olneya* . . ., Nov. 19-21, 1947, *Gentry 7845* AHFH, UC, US; Barril, on Gulf coast, latitude 28 degrees, 20 minutes, Feb. 28, 1935, *Shreve 6986* AHFH; Cape Region, 1901, *Dorffer* UC; Cerralvo Islands, April 19, 1911, *Rose 16890* US; Espiritu Santo Island, April 1, 1931, *Collins, Kearney & Kempton 129* US; on *Machaerocereus* on gravelly slopes, 37 miles northeast of Pozo Aleman, Feb. 28, 1935, *Wiggins 7800* DS, UC; Sierra Giganta above Puerto Escondido, April 21, 1938, *Gentry 3747* AHFH, GH; La Purisima Canyon, 13 miles west of Canipolé, Nov. 17, 1946, *Wiggins 11451* AHFH; San Jose del Cabo, Jan.-March, 1901, *Purpus* UC; Santa Margarita Islands, March 3, 1889, *Brandegee* UC; eastern bajada of Sierra Calvario, Systema de Sierra Viscaino, March 10-15, 1947, *Gentry 7370* AHFH, UC; Todos Santos, Feb. 15, 1928, *Jones 24120* ARIZ, CAS, DS, UC. SINALOA: Los Mochis, Jan. 30, 1927, *Jones* UC; San Blas, Jan. 30, 1927, *Jones* CAS.

4b. ECHINOPEPON MINIMUS (Kell.) Wats. var. **peninsularis** (Gentry) stat. nov. *Echinopepon peninsularis* Gentry, Allan Hancock Pac. Exp. 13:170. 1949. Type: San Jose del Cabo, Cape District, Baja California, Mexico, *Dawson 1193* (AHFH!), photograph KMS! fig. 4.)

Nodes with quite conspicuous hyaline hairs; leaf blades deeply 5-lobed, to 10 cm. in diam.; staminate racemes to 12 cm. long; flowers 8-12 mm. in diam.; fruit with beak 17-22 mm. long; peduncles more than 2 cm. long; seeds more than 3 mm. long.

Southern District of Baja California, Mexico (fig. 5).

Representative specimens seen. MEXICO. BAJA CALIFORNIA: La Paz, Jan. 20-Feb. 5, 1890, *Palmer 65* GH, US; Cape San Lucas and surrounding area, Aug., 1859-Jan., 1860, *Xantus* GH; San Jose del Cabo, Sept. 27, 1890, *Brandegee* UC; edge of broad arroyo and sand dunes near ocean, on *Jatropha* and *Machaerocereus gummosus*, 19.2 km. southwest of San Jose del Cabo, Dec. 17, 1947, *Carter, Alexander, & Kellogg 2248* AHFH, UC; San Jose del Cabo, Cape District, *Dawson 1193* AHFH; Todos Santos, Sept. 18, 1893, *Brandegee* UC; rocky canyon bottom under oaks, shade, Arroyo Hondo, Sierra Giganta, Dec. 13, 1938, *Gentry 4125* ARIZ, DS, GH, UC.

5. ECHINOPEPON CIRRHOPEDUNCULATUS Rose, Contr. U.S. Nat. Herb. 1:100. 1891. Type: "Common about Alamos. . ." southern Sonora, Mexico, *Palmer 634*, 1890 (US 43926!, photographs KMS!, fig. 3; isotype GH!).

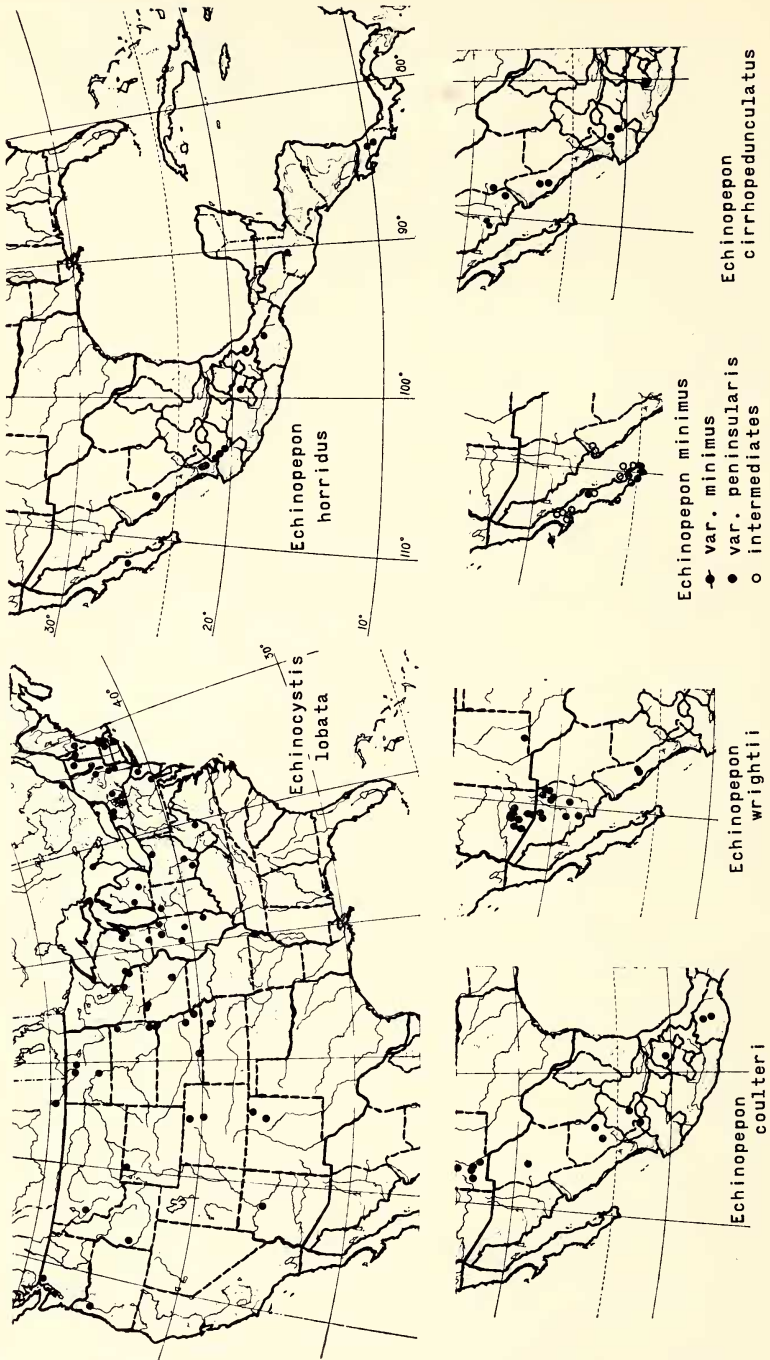


FIG. 5. Distribution maps of *Echinocystis* and *Echinopepon*.

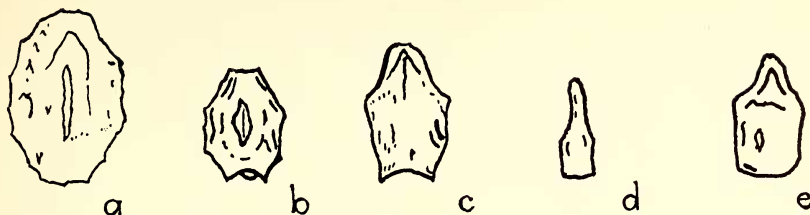


FIG. 6. Seeds of *Echinopepon* species: a, *E. horridus* (Pringle 4563 US); b, *E. coulteri* (Coultter 51 GH); c, *E. wrightii* (Wright 1090 GH); d, *E. minimus* var. *minimus* (Palmer 719 GH); e, *E. cirrhopedunculatus* (Pringle 4562 GH). All  $\times 2$ .

Stems slender, 1–1.5 mm. in diam., the internodes 6–15 cm. long, glabrous except for rather conspicuous tufts of hyaline trichomes at the nodes; trichomes to 6 mm. long; leaf blades cordate, 3–7 cm. wide, a few somewhat longer than wide, usually distinctly 5-lobed, the triangular central lobe often twice as long as others, the basal sulcus usually deeper than broad, to 1.5 mm. deep, 0.5–1 mm. broad, the central apex usually acute, others usually obtuse, the margins denticulate-dentate, the upper surfaces muricate, veins hispid, the lower almost glabrous; petioles 2–3.5 cm. long, with few short heavy hairs; tendrils commonly bifid, on peduncles 1–2 cm. long, glabrous; staminate flowers 10–30 per raceme, racemes slender, 5–15 cm. long, pedicels to 20 mm. long, several often arising at one point on peduncle; flowers small, calyx lobes subulate 0.17–0.33 mm. long, not quite as wide at base, greenish; corolla campanulate, 4–7 mm. in diam., lobes triangular, somewhat obtuse, 1.5–2 mm. long, almost as broad, glands rather inconspicuous; stamens with anther mass globose, 1 mm. in diam., not quite as long, the filament column 1 mm. long; pistillate calyx lobes broadly subulate to 0.25 mm. long; corolla open campanulate, to 8 mm. broad, lobes oblong-ovate to 1 mm. long, 0.5 mm. wide at base, apices acute-obtuse, both surfaces minutely glandular; stigma thick, discoid, 0.67 mm. in diam., 0.4 mm. thick; style slender to 1 mm. long; fruit oblong-elliptical, cylindrical, exclusive of beak 25–35 mm. long, 8–12 mm. in diam., the beak 12–18 mm. long, glabrous, the spines slender, to 1 cm. long; peduncle tendril-like, springy, 4–12 cm. long when coiled; seeds oblong, apex notched, truncate, base slender, 5 mm. long, 3 mm. wide, 2 mm. thick, somewhat tuberculate, dark brown.

Central and western Mexico in the states of Chihuahua, Jalisco, Mexico, Sinaloa, Sonora (fig. 5).

Representative specimens seen. MEXICO. CHIHUAHUA: valley margin slope, Guasaremos, Río Mayo, Aug. 3, 1936, *Gentry 2355* ARIZ, GH, UC, US. JALISCO: on road between Bolaños and Guadalajara, Sept. 22, 1897, *Rose 3052* US; banks, Tequila, Oct. 3, 1839, *Pringle 4562* GH, UC, US. MEXICO: barranca, Chacamerito, Dist. Coyuca, Aug. 14, 1934, *Hinton 6438* GH; Ipericones, Temascaltepec, Sept. 23, 1935, *Hinton 8483* AHFH, GH. SINALOA: Cerro Colorado, vicinity of Culiacan, Nov. 3, 1904, *Brandegge* UC; slope, under shrubbery, oak-*Ipomoea* savannah, elev. 3,000 feet, Las Mesas, Sierra Surotato, Sept. 15, 1941, *Gentry 6657* GH. SONORA: infre-



quent, around milpas, Alamos, Oct. 29, 1939, *Gentry 4783* AHFH, ARIZ, DS, UC; Alamos, Sept. 16-30, 1890, *Palmer 634* GH, US; weedy flat, 11 miles northeast of Colorado, between Colorado and Mazatan, Sept. 6, 1941, *Wiggins & Rollins 335* DS, GH; moist swale, 10 miles south of Mazatan, Sept. 7, 1941, *Wiggins & Rollins 367* AHFH, DS, GH, UC.

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### MOSES OF CALIFORNIA V. PTERIGONEURUM OVATUM AND P. SUBSESSILE

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*Pterigoneurum ovatum* (H.) Dixon was reported by the author (1949) as unrepresented in California, although it was known to occur in other western states and as far east as North Dakota, Wyoming, Utah, New Mexico, and Texas (Wareham, 1939). *Pterigoneurum subsessile*, given by Wareham as occurring in "Western North America, east to Illinois," also was reported by the author as unrepresented in the flora of California (Koch, 1950), although it was mentioned by Sullivant (1856) as growing there and investigators later assumed its presence. Nevertheless, Californian collections of these two species did not seem to exist in any of the herbaria whose specimens were available to the author.

On 24 January 1952, plants of both species (*Koch 4029, 4026*) were found at the southern fringe of Bakersfield 5 miles west of U. S. Highway 99, Kern County. The southern end of the Great Valley does not drain into the San Joaquin River. It is an independent basin without an outlet to the sea and the vegetation is properly classified as an "Alkali Sink Community" of the "Southern Desert" biotic province by Munz and